



# **Accelerated Cell Production Technology (AcCePT)**

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## WCSAR's MISSION

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WCSAR is a NASA Research Partnership Center (RPC) with its mission of assisting industry in the development of novel technologies and products derived from space-based plant biotech research, and thereby, to contribute to an improved quality of life on Earth.





# ON-GOING R&D ACTIVITIES

## Robotics/Automation Research

- ***Microarraying (a.k.a. genechip) Robot:***  
To develop advanced spotting and environment technologies for high density microarray production
- ***Accelerated Cell Production Technology (a.k.a. Bioreactor):***  
To develop high throughput bioreactors for the commercial production of high value proteins and metabolites
- ***Autonomous Crop Harvesting Robot:***  
To develop self-navigated and autonomous crop harvester for NASA's Biomass Production System
- ***Controlled Environment Technologies***  
To develop state-of-the-art technologies and systems for better control of air quality, food quality, photodynamic therapy, and national security





# ON-GOING R&D ACTIVITIES (CONT.)

## Plant Biotech Research

### ➤ ***Biosynthesis of Novel Phytochemicals/Metabolites***

Using microgravity environment to enhance the biosynthesis of commercially interest secondary metabolites and phytochemicals using WCSAR-developed technologies and NASA-provided opportunities.

### ➤ ***Advanced Crop Transformation Systems***

To develop effective transformation systems for genetic engineering of agriculturally important crops such as soybean, corn, rice, wheat, barley,...

### ➤ ***Nutraceuticals and Functional Foods***

To identify/isolate pharmaceutically important compounds from plants and to study the their stability after incorporated into foods and drugs.

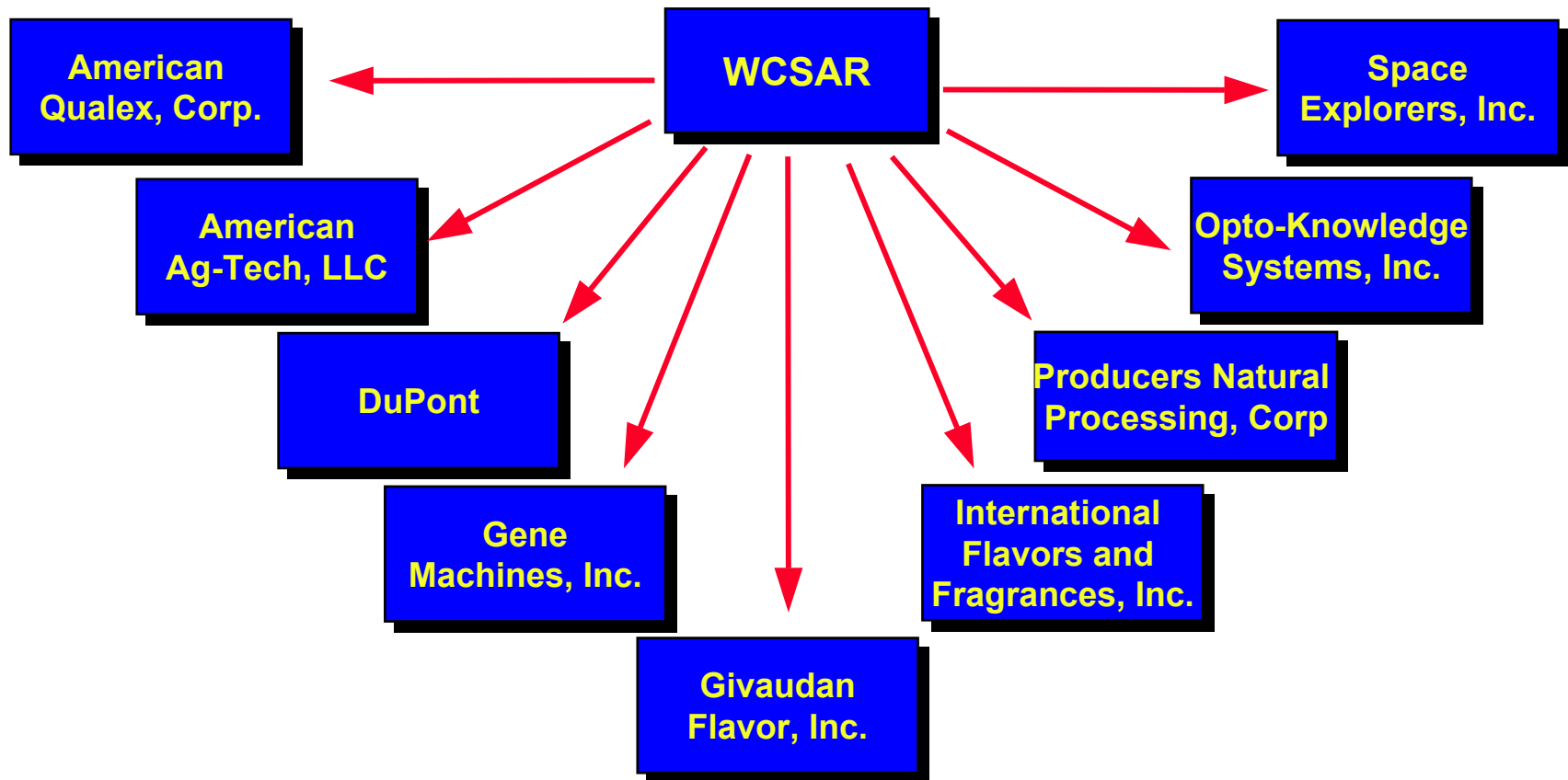
### ➤ ***Recombinant Protein Development:***

To produce commercially valuable proteins in plants





# INDUSTRY COLLABORATION





# INTRODUCTION OF AcCePT™

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## Major Issues with Existing Technologies

- High Shear-stress
- Cell settling
- Cell aggregation and wall growth
- Low yield





# INTRODUCTION OF AcCePT™

## AcCePT design focuses on

### ➤ Multi-dimensional agitation

Analysis using the Computational Fluid Dynamics (CFD) has provided optimal solutions for the agitation, which minimizes the shear stress, cell aggression, and wall growth.

### ➤ Stimulation of cell kinetic energy

Using near-infrared LEDs to energize the basic energy processes in energy compartments of cells and hence, to enhance cell metabolite energy.

### ➤ Environment control

Provide environment control (CO<sub>2</sub>, temperature,...) to create an optimal environment for cell cultivation.

### ➤ Significantly improved productivity





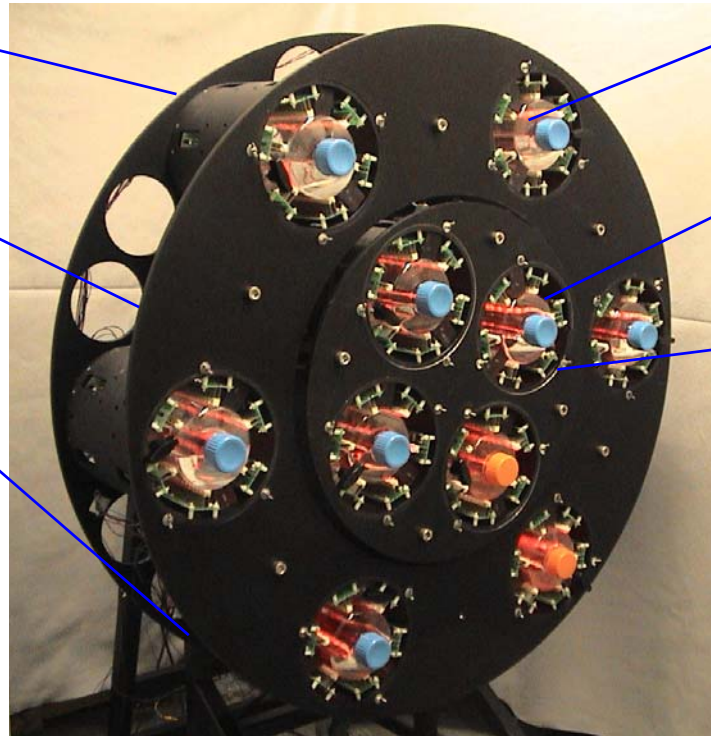


# INTRODUCTION OF AcCePT™

Nutrient delivery  
(in the back)

Waste collection  
(in the back)

Motion control  
(multi-DOFs)



Suspension culture  
vessel (2.5 L volume)

LED photo treatment

Temperature control







# INTRODUCTION OF AcCePT™

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## Applications Using AcCePT™

*(A Joint Efforts with PNP and American Qualex)*

- DNA Vaccine Production
- Monoclonal Antibody Production
- Protein and Peptide Production
- Secondary Metabolite Production





## INITIAL TRIAL RESULTS

[Available upon request](#)

